Space Weather Forecast

Issued on Thursday 6 February 2025 at 12:44 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate radio blackouts (R1/R2) expected. Increased near-term chance of Minor solar radiation storm (S1). Increasing chance of Minor/Moderate (G1/G2) geomagnetic storms into UTC weekend.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity was Moderate over the past 24 hours, with frequent mid-ranking Common-class flares observed that were later trumped by a peak Moderate flare at 06/1104UTC from the largest and most complex region in the northwest.

There are now up to twelve active regions on the Earth-facing side of the Sun. The northwest remains the dominant quadrant, with a cluster of large and complex regions, with the largest remaining the most active. This group saw mixed fortunes in terms of growth in the period, with trailing spot areal decay, but conversely some emergence in its central portions. The region immediately to its north saw the most marked growth of the period, with strong proliferation of small leading and central spots. The other regions in this northwestern cluster, meanwhile, generally showed slight decay. Other parts of the facing side showed minor sunspot development (as in the southwest), else were populated by smaller and stable apparently magnetically unipolar groups, as in the east.

At the time of writing, no CME was visible on satellite imagery from the Moderate-class flare, however some extreme UV imagery does hint in ejecta being released. Further relevant imagery is awaited.

Prior to this event, apparently minor small 'filament' (arc of plasma) activity near the trailing spots of the largest and most complex region were observed in extreme UV imagery around 05/2030UTC and 06/0530UTC, however no resultant CMEs (Coronal Mass Ejections) were observed. At present, no new CMEs have been identified in the past 24 hours.

Solar Wind / Geomagnetic Activity: Solar winds varied from initial background conditions to show an enhancement later in the 24 hours to slightly elevated solar wind speeds. The cause of this enhancement is uncertain, however a glancing interaction with the Modreate class flare-related 02/2320UTC CME was mooted for around this time.

The number of particles in the solar wind rose from low single figures to peak at slightly elevated levels with this speed rise (before falling). The associated magnetic field initially showed a gradual

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rising trend from background levels, rising to a slightly elevated peak around 06/0330UTC before decreasing in magnitude and becoming more erratic thereafter.

The net result of the above solar wind measures was provisionally quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: High energy proton flux was at background levels, however any response from the Moderate-class flare is awaited and may show in the coming few hours.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is expected at first, with isolated Moderate-class flares and a slight chance of Strong-class flares, most likely from the largest and most complex region, and perhaps now its immediate northern neighbour in the northwestern cluster of sunspot regions.

Solar Wind / Geomagnetic Activity: Up to two CMEs feature in the forecast - firstly the 02/2320UTC CME which is anticipated to pass the radius of Earth's orbit imminently, and may in fact be in course as of the time of writing of this guidance as a glancing blow.

The second CME arose from a 'filament eruption' in the southwest from early on 05 February, which has a low chance of delivering a glancing blow late day 2 or day 3 (Friday 07 into Saturday 08 February). Both events are low confidence. The potential for further CMEs is currently elevated but reducing as the main sunspot cluster moves further from the solar meridian.

The next recurrent coronal hole fast wind may then feature on Sunday 09 February, but with some potential to arrive earlier in the UTC weekend given its apparently increased intensity versus last pass, and by inference, increased speed.

There is a peak Chance of G1/G2 Minor/Moderate geomagnetic storm conditions in this four-day period. The first peak is lower confidence but would potentially be of greater magnitude if present, from 08 into 09 February from the 05 February filament. The UTC weekend should then see an increasing Chance of G1 from the coronal hole fast wind.

Energetic Particles / Solar Radiation: There is now a chance of S1 minor solar radiation storm conditions from the recent Moderate-class X-ray flare within the remainder of the current UTC day and perhaps into Friday 07 February. The underlying slight day-on-day rise in risk otherwise remains, as the northwestern sunspot region cluster moves into a better-connecting position with Earth.

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Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	20	50
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 (M Class)	Yes	80	70	70	70
Very Active	R3-R5 (X Class)	No	20	20	20	20

Solar Radiation Storms (High Energy Protons)

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	30	25	20	25
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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